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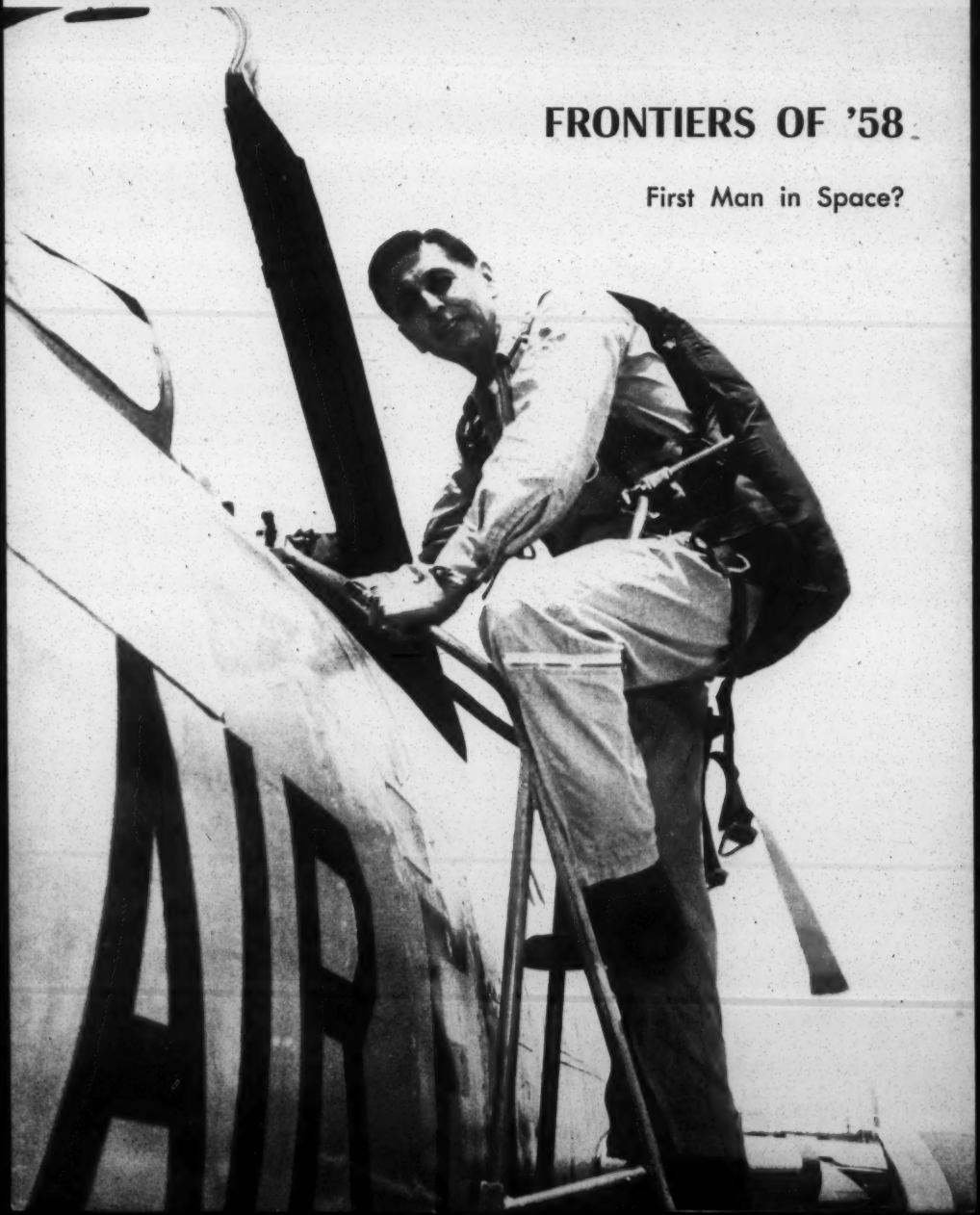
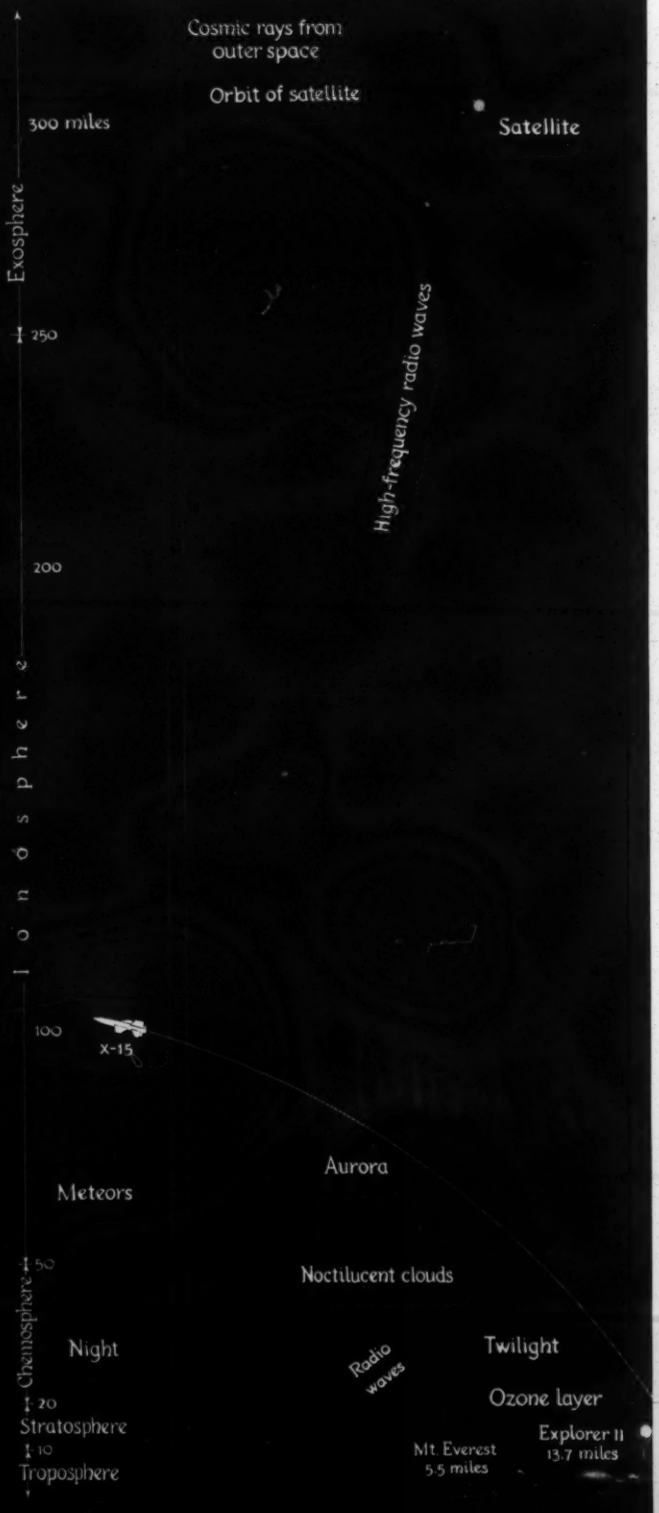
FRONTIERS OF '58

First Man in Space?





GULPING its liquid oxygen fuel, the X-15 will use up all its power during a steep climb. Well into the ionosphere, above the point where meteors flash into incandescence, above the drapery of aurora, the silent plane will hurtle through its arching flight. Crossfield will become weightless. Small jets of hydrogen peroxide will keep the nose straight, the wings aligned.

Re-entering the denser atmosphere, the nickel-steel alloy skin of the X-15 will redden at 1,000°F. Insulation and air conditioning will keep Crossfield from broiling.

Satellites have pierced this frontier. Information from them indicates that heavy radiation exists above 650 miles, that meteorites seldom strike a space vehicle. The X-15, in turn, will disclose new secrets and change other concepts.

The chart shows space subjects discussed in this year's *Geographic School Bulletins*—meteors, aurora, a baby "moon," the *Explorer II* balloon (see index). E.P.

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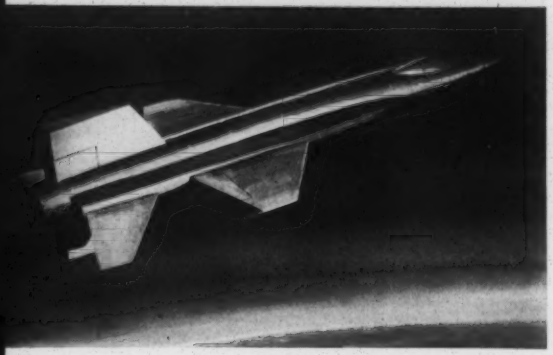

HALF PLANE, half missile, the North American X-15 is man's first, primitive spaceship. It is built to carry a human being into the edge of space—that most inhospitable frontier that lies so tantalizingly close overhead. Seen here in an artist's concept, the X-15 will fly late this year.

COVER shows a pilot boarding an Air Force jet. This Space-Age Columbus will rocket to the unknown.

X-15 AND ITS PILOT AIM AT SPACE

FIRST MAN to fly the X-15 will be North American's test pilot and design specialist, Scott Crossfield. To check the rocket plane, he will climb higher than 100 miles and fly faster than one mile per second.

To survive the physical effects of such a speed and altitude (four times higher than any man has flown before) Crossfield is undergoing rigid tests. Laboratory machines mimic almost all conditions of the flight—the pressure of acceleration, the buffeting of high speed.

Here, the man slated to explore the edge of space steps from a Navy centrifuge—a giant top in which he has been subjected to the crushing pressure of centrifugal force. Crossfield's full pressure suit will keep him alive in the near-vacuum 100 miles up.

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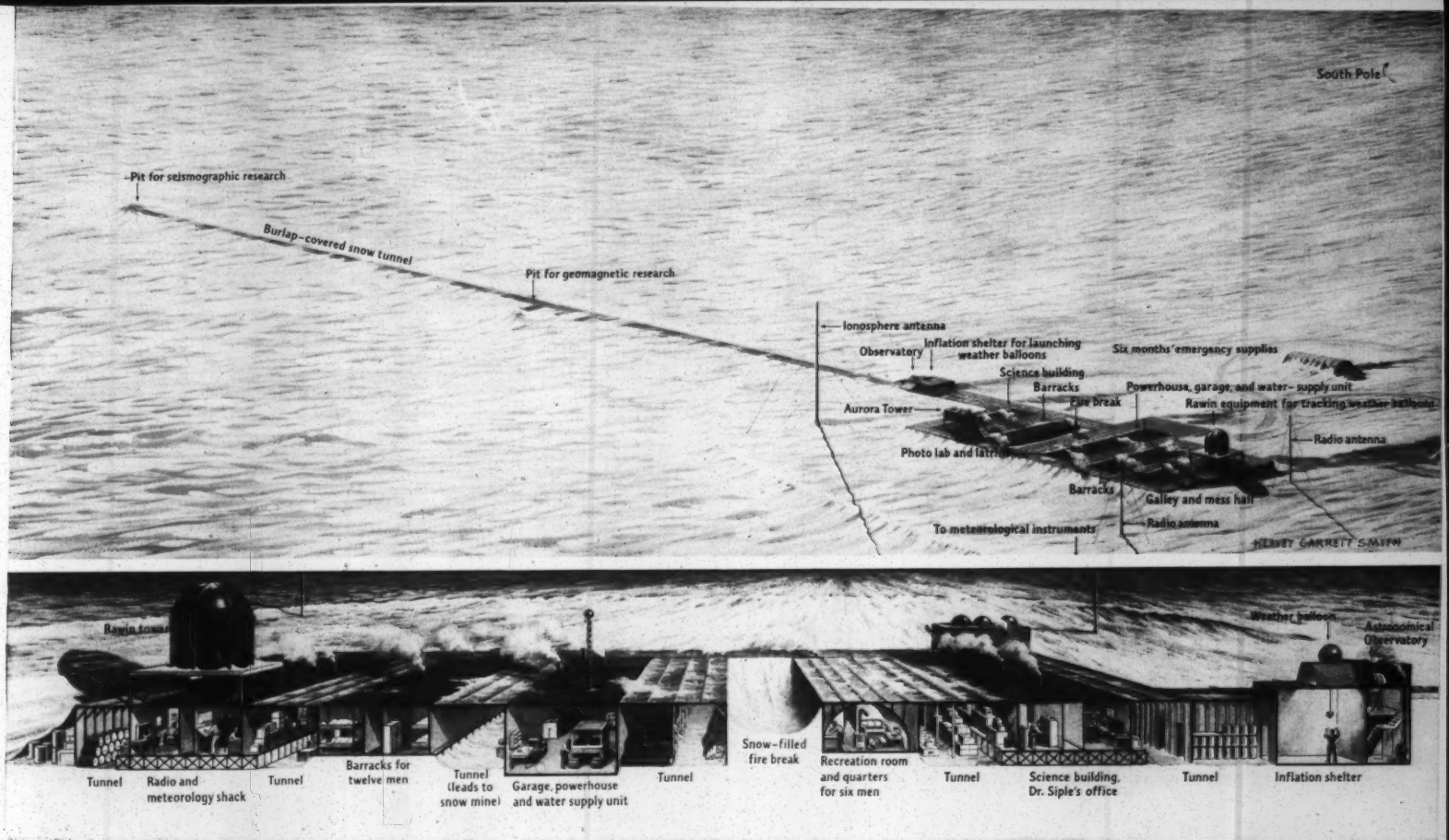

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SOUTH POLE—AMERICAN TOWN

IGY Personnel, Under "Mr. Antarctica," Hold Down Man's Bleakest Settlement, at the End of the Earth

PHOTOGRAPHS BY THOMAS J. ABERCROMBIE, NATIONAL GEOGRAPHIC STAFF

DR. PAUL A. SIPLE, chief scientist at the South Pole, has visited the last frontier continent since boyhood. His timely report appears exclusively in the April, 1958, *National Geographic*.

DURING the six dark months of Antarctica's past winter, 18 Americans endured earth's coldest temperatures at science's uttermost outpost—the South Pole. Breaking the continent's secrets, they compiled a wealth of data for International Geophysical Year.

Their base stays manned and probably will remain a scientific laboratory. Its floor is 8,300 feet of ice, on 900 feet of rock. Its domes, chimneys, and masts, peeking above the snow, are lashed by 50-mile-an-hour winds. Meteorologists brave the cold to check instruments, left. On 169 consecutive days last winter, temperatures huddled below —40°. A cold snap produced —102°, a record only recently broken.

A snow-smothered village, right, the United States South Pole Station had residential and business sections, a recreation center, warehouses, even a community flag—at the Pole itself.

Science Probes New Power Source

GREAT Britain spawned the industrial revolution, as any junior high student knows. To run its mills, coal has been steadily mined from its green pastures and tumbling hills. Today, British coal supplies are running thin. There is no oil on the little islands—all supplies come from overseas.

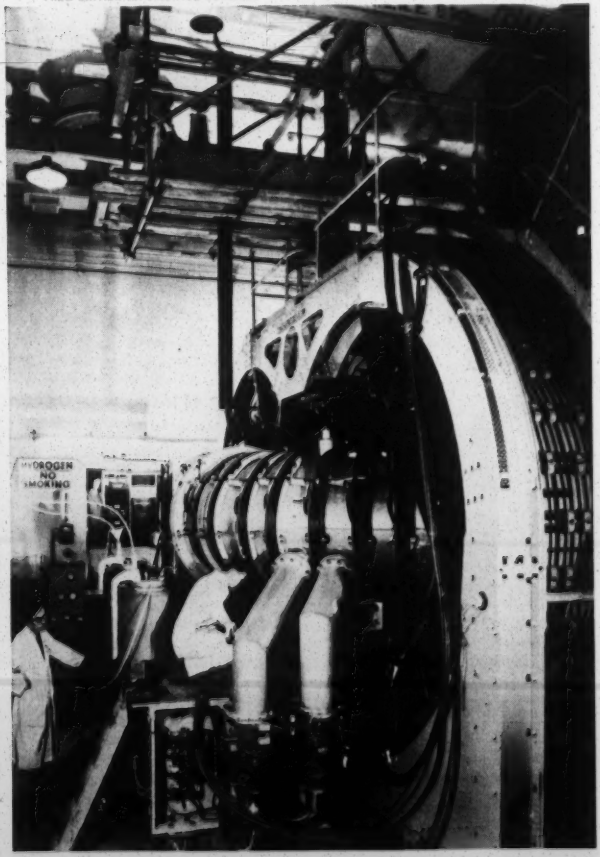
To fill the gap, Great Britain has kept one alert eye peeled for new sources of power. When the atomic age dawned, the British began experimenting with atomic energy as the logical answer.

Early this year, scientists at the Atomic Energy Research Establishment at Harwell, England, announced that they are taking a step toward harnessing the energy gained by joining atoms. The element they use is deuterium, a heavy form of hydrogen. Fusing two nuclei of deuterium atoms releases heat. On a gigantic scale, this thermonuclear energy, stored in a hydrogen bomb, can wipe out a city. But it also can be controlled to help man instead of obliterate him.

Experiments at Harwell, then, are exploring a frontier of incalculable importance, not only to Great Britain, where the need for power is pressing, but for all the world. Old resources are gradually diminishing. Atomic energy can someday replace them.

A British science writer points out that a bucket of water contains about a fifth of a gram of "heavy hydrogen" (deuterium). When scientists are able to extract all thermonuclear energy from this small amount of gas, it will do the same work as two tons of coal. In other words, as long as rain falls, as long as rivers run and the oceans lap our shores, the world need never worry about power.

FROM BRITISH INFORMATION SERVICES



Harwell is not the only atomic energy plant working toward that goal. The British Zero Energy Thermonuclear Assembly (Zeta), left, produced temperatures of 5,000,000° C., about a third of the estimated temperature at the heart of the sun. Recently, more heat has been created. To furnish power economically a thermonuclear device will have to release some 100,000,000° C.

Main problem is to keep fantastic heat away from container walls. Zeta did this by "squeezing" hot gas in an electromagnetic field—an achievement that raised hopes as well as temperatures. E.P.

ON EARTH'S surface, one stretch of land remained to be crossed—the hostile, ice-shrouded continent of Antarctica. Polar explorer Sir Ernest Shackleton called it the "last grand journey left to man."

At 1:47 p.m., March 2, 1958, that journey ended. Dr. Vivian E. Fuchs, a 47-year-old British scientist, pulled up at Scott Station on McMurdo Sound. Behind him lay 2,100 ice-glaring miles, freshly scarred by the spiked tracks of his weasels and sno-cats (right).

A veteran explorer-scientist, Sir Vivian Fuchs (as he is now called) had a part to play in the International Geophysical Year. His methodical survey, carried out through bitter hardship and breath-taking danger, traced a ribbon of knowledge across the blank wastes of man's last frontier land.

PHOTOGRAPHS FROM BRITISH INFORMATION SERVICES

TWO THOUSAND MILE TREK CONQUERS LAST CONTINENT

DR. Fuchs led the Commonwealth Trans-Antarctic Expedition from Britain's Shackleton Station last November 24. Hopefully, he allowed 100 days to make the trek across the heart of Antarctica and escape being trapped by the polar night.

The trip took him exactly 99 days—with time off for a hot shower at the United States South Pole station (previous pages). At regular intervals the expedition paused to bore a 36-foot hole and fire an explosive charge beneath the snow. Seismographs picked up the reverberations of each blast, tracing the pattern of the land contours, smothered by snow and ice. Other instruments measured gravity.

Skin peeled off bare fingers as men checked equipment. White-outs—blinding curtains of snow glare—forced drivers to steer by magnetic compass. Sometimes, vertical ice cliffs delayed progress; sometimes vehicles broke through roofs of ice caverns. When motors stopped, utter silence fell.

Fuchs found his way to the Pole across a previously unknown region, supporting himself with his cargo of supplies. From the Pole on, the going was easier, thanks to Sir Edmund Hillary, conqueror of Mount Everest, who had set up regular supply depots for this last leg of the journey.

One result of the epic adventure was to gain proof that, along the expedition's route, at least, Antarctica consists of solid land, not a series of islands buried by ice. Fuchs found no interior mountains comparable to those hoisting 15,000-foot peaks not far inland from McMurdo. But many crevasses gave clues to mountain tops not far below. Antarctica slopes generally upward from Weddell Sea to McMurdo Sound.

Bearded and happy, the Briton remarked, "We did what we set out to do." S.H.

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DR. EDGERTON'S camera, fitted into a steel cylinder, has dropped to a depth of 24,600 feet to photograph Atlantic's Romanche Trench (*National Geographic Magazine*, March, 1958). There it made the picture below, man's deepest view. Organisms, circled, prove the presence of life.

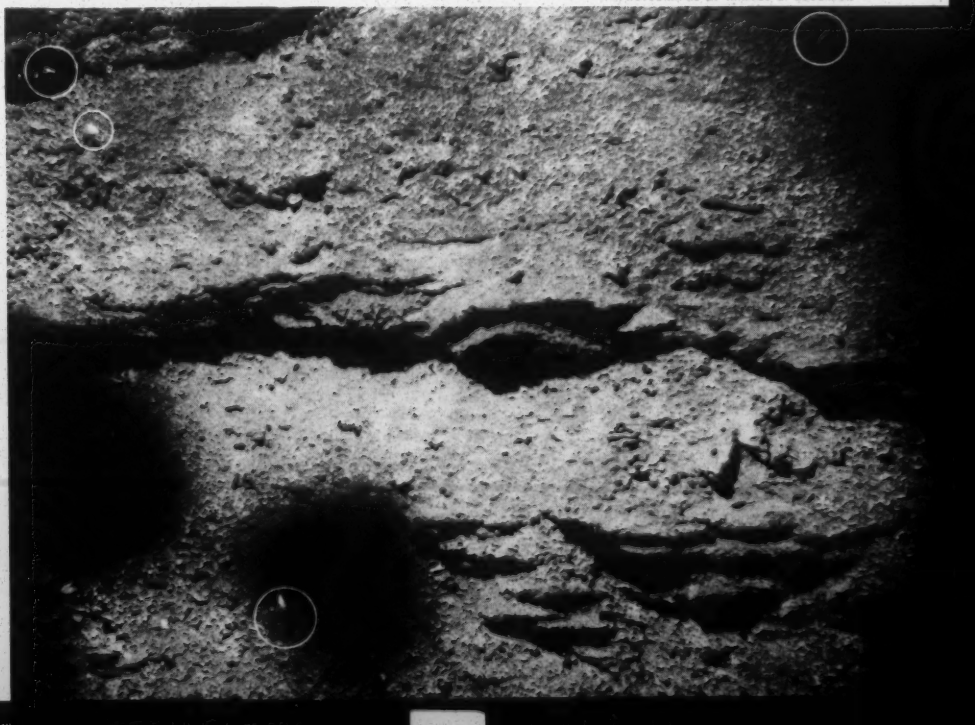
MAN SCANS DARK UNDERSEA WORLD

FOR centuries, the question haunted men: How does the frontier beneath the sea look? Now we know, thanks to photography.

Dr. Harold E. Edgerton (left), professor of Electrical Measurements at Massachusetts Institute of Technology, broke the mysteries with a deep-sea camera, invented with the aid of research grants from the National Geographic Society. Lowered by nylon line, the instrument withstands a pressure of 17,000 pounds per square inch. This is more than the pressure of water at the greatest known ocean depth—the 35,640-foot Challenger Depth near Guam.

Once the Edgerton camera was lowered nearly three miles into the Mediterranean. In the black abyss, its quick eye recorded some shrimps, one small fish, and an old tin can. Unreckonable billions of animate and inanimate objects await the deep-sea photographer's figurative "Hold it, please." A huge region of the earth awaits discovery by this scientific eye. S.H.

PHOTOGRAPHS BY HAROLD E. EDGERTON



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Man's Questing Knows No Bounds

The Edgerton camera has plumbed extreme depths of the oceans. Thanks to French naval designers, men, too, have trespassed on this dim frontier to a depth of 2½ miles. Their bathyscaphe (right) has been called a "wonderful new dirigible of the depths." It carries 20,000 gallons of lighter-than-water gasoline to "inflate" the hull and give it buoyancy. Lead shot serves as ballast, as it does in a balloon. From pressurized gondola, scientists look out on the undersea world, lit by spotlights. Painting shows the bathyscaphe exploring a murky canyon off the coast of Portugal. Weird plants gesture at the intruder. Dogfish sharks glide by, their eyes white and bulbous in the dark.

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